

### Remarks

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

Thus, claims 23-43 have been replaced by new claims 44-63, which correspond to the cancelled claims except as noted below, where the claim numbers refer to the claims which have been examined (claims 23-43) so as to facilitate a comparison with the claim objections and rejections set forth by the Examiner.

#### Claim objections

- 1 & 2. Claim 23: The Examiner is correct. The claim has been amended accordingly.
- 3 & 4. Claim 34: The claim has been amended as requested by the Examiner.
5. Claim 35: The claim has been amended as requested by the Examiner.
6. Claim 35: The claim has been amended as requested by the Examiner by defining  $R^3$  and  $R^4$  and n, thereby removing the reference to Claim 1.
7. Claim 38: The claim has been amended as requested by the Examiner by cancelling "of Claim 1" at the end of Claim 38 and by defining  $R^1$ , thereby removing the reference to Claim 1.
8. Claim 39: The claim has been amended as requested by the Examiner by cancelling "of Claim 1" at the end of Claim 39 and by defining  $R^2$ , thereby removing the reference to Claim 1.
9. Claim 41: The claim has been amended as requested by the Examiner by cancelling "of Claim 1" at the end of Claim 41 and by defining  $R^1$  and  $R^2$ , thereby removing the reference to Claim 1.
10. Claim 43: The claim has been amended as requested by the Examiner by cancelling "of Claim 1" at the end of Claim 43 and by defining  $R^1$  and  $R^2$ , thereby removing the reference to Claim 1.

Please note the following two additional amendments.

Claim 23: The definition "substituted straight-chain alkyl, unsubstituted straight-chain alkyl," has been omitted, and has been reintroduced into the definitions for  $R^8$ ,  $R^9$ ,  $R^{10}$  and  $R^{10}$ . As a basis, see, for example, the published application text of US 2007/0161762 A1, page 39.

Claim 33: The wording "catalyst" in claim 33 has been replaced by "complex", as claim 33 refers to claim 32, which is directed to a "complex".

Accordingly, Applicants respectfully submit that all grounds for the claim objections have been rendered moot.

Claim rejections.

12. Claims 26-28 are rejected as being indefinite with regard to chirality. The Examiner is correct in noting that the compounds of claim 23 already comprise planar chirality. Claims 26 and 28 have been amended accordingly. Claim 27 has been cancelled. The remaining claims and claim references have been renumbered.

Accordingly, the rejection of claims 26-28 under the second paragraph of 35 U.S.C. §112 has been rendered moot.

The patentability of the presently claimed invention after entry of the foregoing amendments, over the disclosures of the references relied upon by the Examiner in rejecting the claims will be apparent upon consideration of the following remarks.

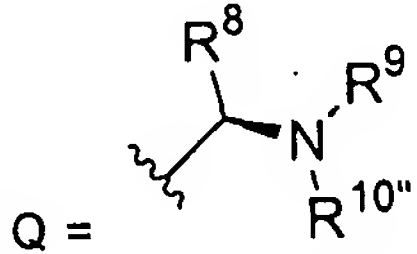
14. Claims 23, 24, 26 and 29-31 are rejected as being anticipated by Butler et al. [Organometallics 1988, 1320-1328], compounds 19, 20, and 24.

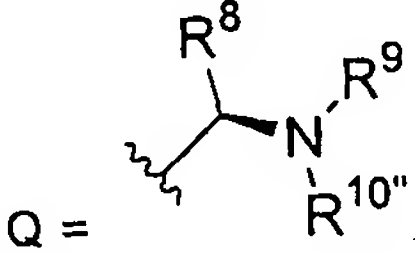
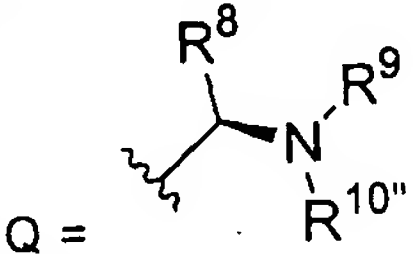
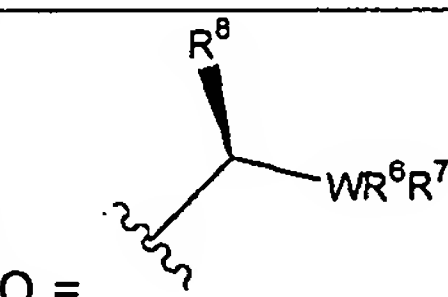
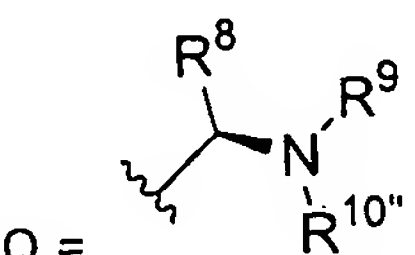
15. Claims 23-26 and 29-31 are rejected as being anticipated by Troitskaya et al. [Russ. Chem. Bull. 1999, 48(9), 1738-1743], compounds 2 and 3.

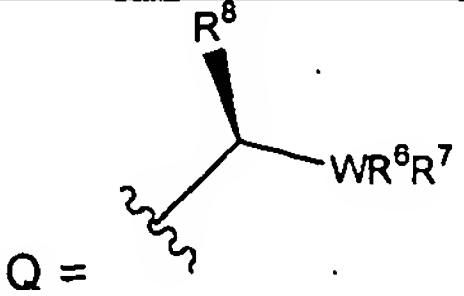
16. Claims 23-26 and 29-32 are rejected as being anticipated by Gambs et al. [Helvetica Chimica Acta 2001, 84, 3105-3126], compounds 2i<sub>a,b</sub> and 3i<sub>a,b</sub>.

All of these rejections are respectfully traversed.

All of the compounds cited by the Examiner appear to fall under instant formula (I) as follows:

Butler et al.: compounds 19, 20, and 24	Formula (I), n,m=0	R <sup>1/2</sup> = straight-chain alkyl (= n-Bu), R <sup>1/2</sup> = branched-chain alkyl (= t-Bu), R <sup>1/2</sup> = unsubstituted carbocyclic aryl (= phenyl)
	 <p>Q =</p>	R <sup>8</sup> = straight-chain alkyl (= methyl), R <sup>9</sup> and R <sup>10</sup> = straight-chain alkyl (= methyl)

Troitskaya et al.: compounds 2 and 3	Formula (I), n,m=0	$R^{1/2}$ = straight-chain alkyl (= methyl), $R^{1/2}$ = unsubstituted carbocyclic aryl (= phenyl)
	 Q =	$R^8$ = straight-chain alkyl (= methyl), $R^9$ and $R^{10}$ = straight-chain alkyl (= methyl)
Gambs et al.: Compound 2i <sub>a,b</sub>	Formula (I), n,m=0	$R^{1/2}$ = unsubstituted carbocyclic aryl (= phenyl), $R^{1/2}$ = substituted carbocyclic aryl (= phenyl).
	 Q =	$R^8$ = straight-chain alkyl (= methyl), $R^9$ and $R^{10}$ = straight-chain alkyl (= methyl)
Gambs et al.: compound 3i <sub>a,b</sub>	Formula (I), n, m=0	$R^{1/2}$ = unsubstituted carbocyclic aryl (= phenyl), $R^{1/2}$ = substituted carbocyclic aryl (= phenyl).
	 Q =	W= P, $R^8$ = straight-chain alkyl (= methyl), $R^6$ and $R^7$ = unsubstituted cycloalkyl (= cyclohexyl).
Bieler: L13-15	Formula (I), n,m=0	$R^{1/2}$ = unsubstituted carbocyclic aryl (= phenyl), $R^{1/2}$ = unsubstituted carbocyclic aryl (= anthracenyl).
Summary	Formula (I), n,m=0	$R^{1/2}$ = straight-chain alkyl (= n-Bu, methyl), $R^{1/2}$ = branched-chain alkyl (= t-Bu), $R^{1/2}$ = unsubstituted carbocyclic aryl (= phenyl), $R^{1/2}$ = unsubstituted carbocyclic aryl (= anthracenyl), $R^{1/2}$ = substituted carbocyclic aryl (= 3,5-bis(trifluorophenyl))  <u>disclosed combinations:</u> a) unsubstituted phenyl versus methyl, n-Bu, T-Bu, 3,5-bis(trifluorophenyl), anthracenyl b) n-butyl versus tert-butyl
	 Q =	$R^8$ = straight-chain alkyl (= methyl), $R^9$ and $R^{10}$ = straight-chain alkyl (= methyl)

		$W = P,$ $R^8 = \text{straight-chain alkyl (= methyl),}$ $R^6 \text{ and } R^7 = \text{unsubstituted cycloalkyl (= cyclohexyl).}$
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Applicants hereby make the Examiner aware of the following prior art document from Nicolaus Heinrich Bieler entitled "Asymmetrische Hydroaminierung von Olefinen mit Iridium(I)-Diphosphin-Komplexen", a doctoral and habilitation Thesis, 2000. This thesis can be downloaded from the ETH E-collection. Please find enclosed a summary for this thesis and a copy of page 29 showing ligands L13-15, which are ferrocenyl ligands having a chiral phosphine group bearing a phenyl radical and an anthracenyl radical.

All compounds cited by the Examiner, as well the additional compounds in the paper from N. H. Bieler, seem to be relevant only for instant formula (I) where the integers for n and m are 0.

Applicants have explicitly excluded the relevant compounds from formula (I) via a newly introduced proviso clause in new claim 44, intended to exclude the above pairings for both radicals  $R^1$  and  $R^2$ . The clause will exclude all cited compounds (see the above table, disclosed combinations, variants a) and b)).

Accordingly, all of the rejections under 35 U.S.C. §102(b) have been rendered moot.

19. Claim 33 is rejected for being obvious over Butler et al. [Organometallics 1988, 1320-1328] in view of Cullen et al. [JACS 1980, 102, 988-993].

20. Claim 33 is rejected for being obvious over Butler et al. [Organometallics 1988, 1320-1328] in view of Knochel et al. [US 6,284,925].

21. Claim 31 is rejected for being obvious over Troitskaya et al. [Russ. Chem. Bull. 1999, 48(9), 1738-1743].

22. Claim 31 is rejected for being obvious over Troitskaya et al. [Russ. Chem. Bull. 1999, 48(9), 1738-1743] in view of Knochel et al. [US 6,284,925].

23. Claim 33 is rejected for being obvious over Gambs et al. [Helvetica chimica Acta 2001, 84, 3105-3126].

All of these rejections are respectfully traversed.

Claims 31 and 33 have been replaced by new claims 51 and 53, respectively, both of which are directly or indirectly dependent on claim 44 which replaces claim 23. Claim 44 is considered to be patentable over the applied references for the reasons set forth above, and therefore, claims 51 and 53, directed to a catalyst and a transition metal complex, each comprising a novel and non-obvious ligand according to claim 44, are non-obvious as well.

The Examiner has provisionally rejected claims 23-43 for obviousness-type double patenting as being unpatentable over claims 14-38 of Serial No. 10/586,204. The Examiner is kindly requested to hold this rejection in abeyance, pending an indication that the claims of the present application are otherwise in condition for allowance.

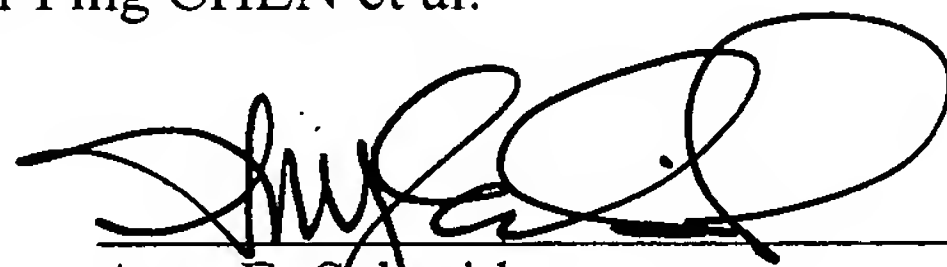
Therefore, in view of the foregoing amendments and remarks, it is submitted that each of the grounds of objection and rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Applicants also note that the European application corresponding to the present U.S. application has been allowed/granted.

Respectfully submitted,

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## Asymmetrische Hydroaminierung von Olefinen mit Iridium(I)-Diphosphin-Komplexen

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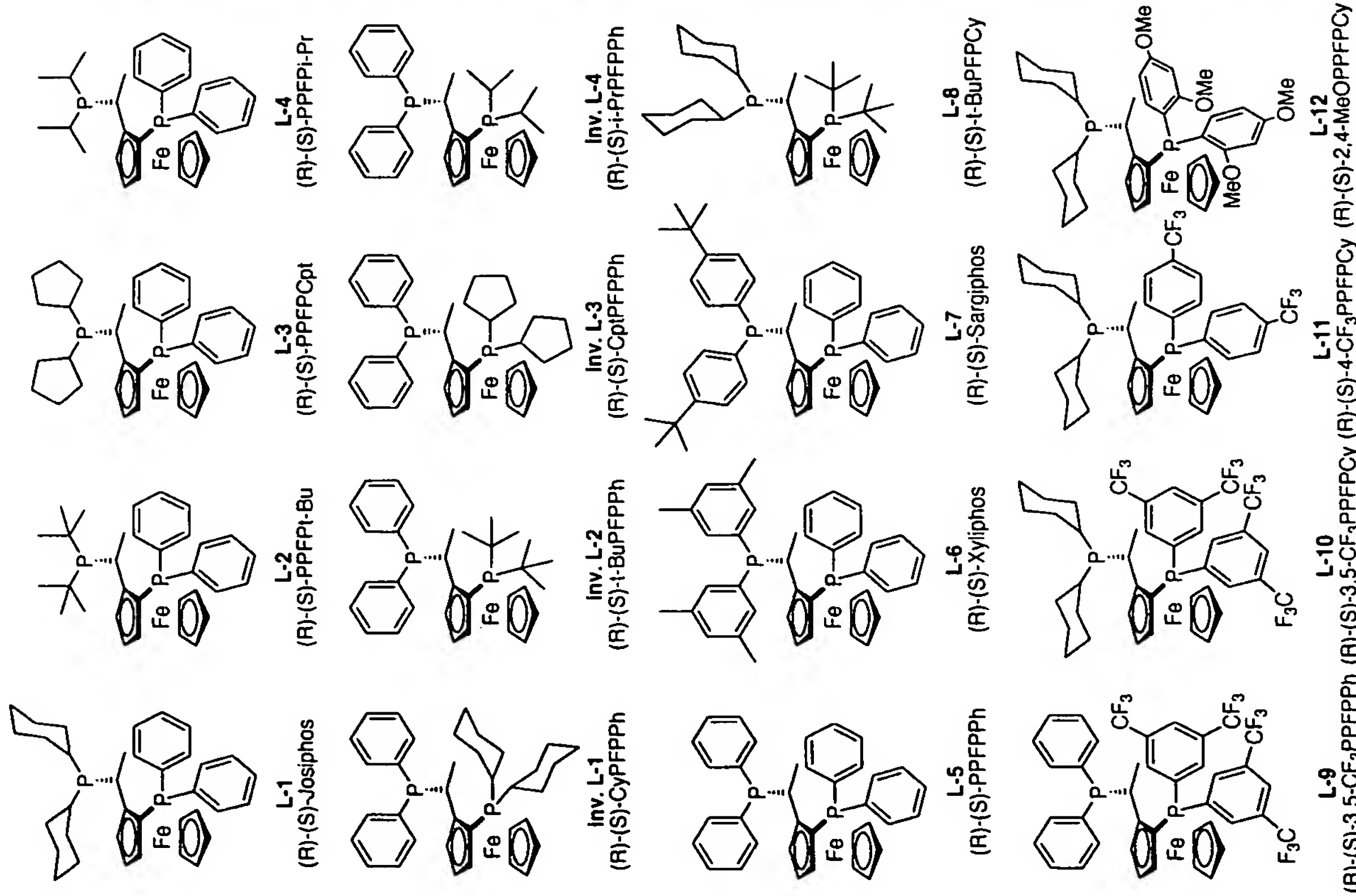
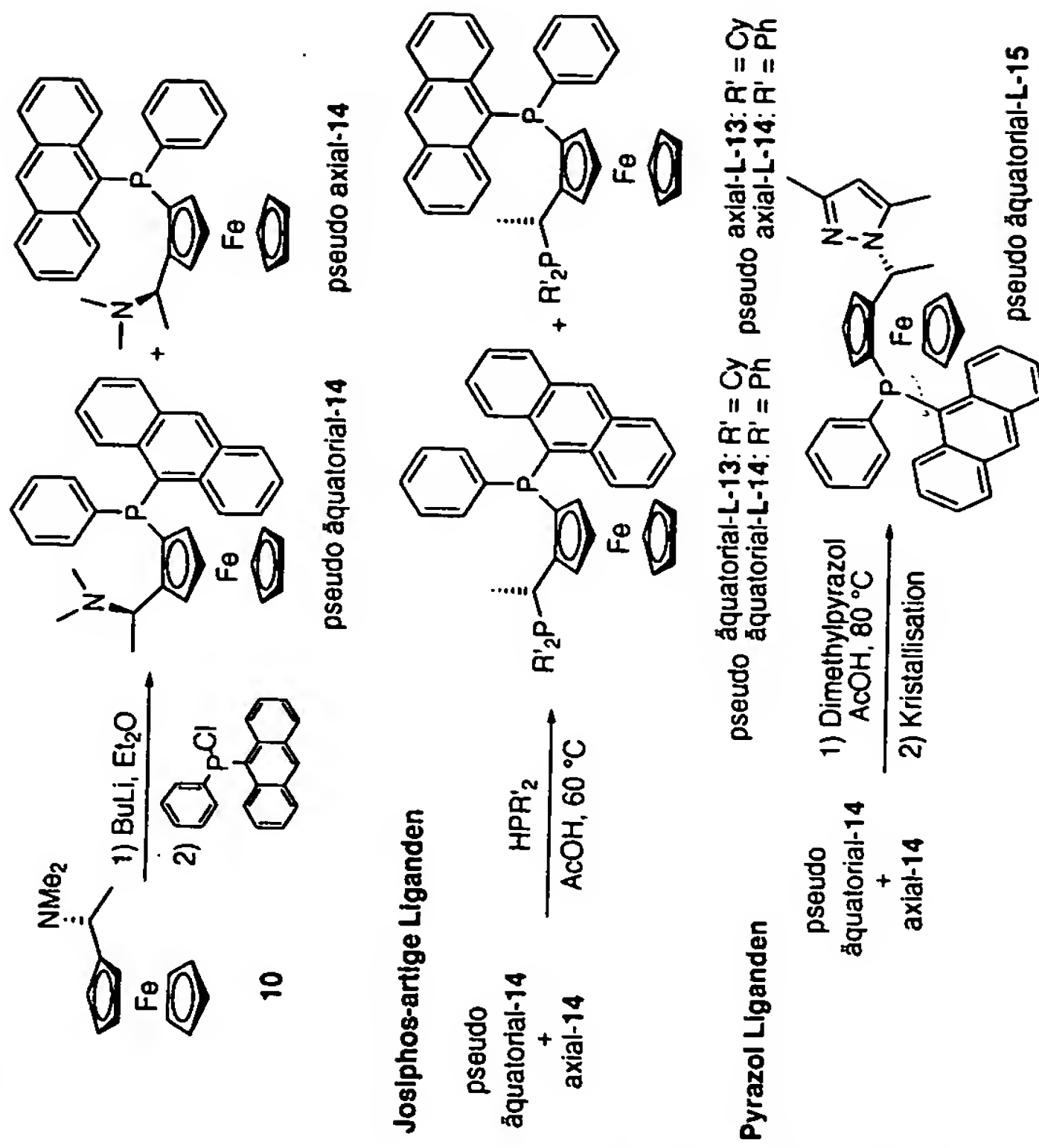


Abbildung 3.1: Zusammenstellung der Ferrocenyldiphosphinliganden L-1 bis L-12.

### 3.2 Josiphos- und Pyrazol-Liganden mit drei Chiralitätselementen

Eine weitere Möglichkeit die Josiphos-artigen Liganden weiter zu modifizieren, besteht darin Chiralität am Phosphor einzuführen. Neben der *planaren* Chiralität und der *zentralen* Chiralität am Ethylrest lassen sich so zwei neue stereogene Zentren realisieren. Um chirale Phosphine herzustellen gibt es eine Vielzahl verschiedener Methoden.<sup>36-38</sup>

Für die geplanten Versuche sollten uns jedoch 1:1- oder mittels FC oder Kristallisation angereicherte Epimerengemische genügen. Durch die Addition eines Phosphins mit einer Anthracenylgruppe am Cp-Ring erhoffte man sich durch diese sperrige Gruppe signifikante Effekte auf die Bildung der dinuklearen Iridium(I)-Verbindungen  $[\text{Ir}(\mu\text{-Cl})(\text{PP})]_2$ . So wurden analog zu der oben beschriebenen Methode die Liganden L-13 bis L-15 mit drei Chiralitätselementen hergestellt, die von uns so genannten «trichiralen»<sup>†</sup> Liganden (vgl. Schema 3-3).



Die von uns eingeführte Nomenklatur bezog sich in erster Linie auf die Stellung der Anthracenylgruppe. So wurden die PPFA-artige Verbindungen mit *pseudo axialer* Anordnung der Anthracenylgruppe zum Beispiel als *pseudo axial-(R)-N,N*-Dimethyl-1-(S)-

†. «Trichiral»: 1) planare Chiralität 2) zentrale Chiralität an der Ethylgruppe 3) Chiralität am Cp-Phosphor